

TITLE

PROPANE TANK VENDING MACHINE

CROSS-REFERENCE TO RELATED APPLICATION

5 This application claims the benefit of U.S. provisional patent application Serial No. 60/443,753 filed January 30, 2003.

BACKGROUND OF THE INVENTION

10 The present invention relates generally to vending and dispensing machines and in particular to such a machine for vending a plurality of relatively large articles, such as propane storage tanks.

Standard valved cylinders for propane gas, such as the type typically used for outdoor grilles, pose vending problems. These cylinders have a cylindrically shaped tank, a base mounted to the bottom of the tank, a valve at the top of the tank, and a guard
15 substantially encircling the valve and providing a pair of lifting handles. The base and the guard have diameters smaller than the diameter of the outer surface of the tank. These standard propane cylinders can be relatively heavy, at least 20 pounds, and difficult for some customers to lift and manipulate.

The U.S. Pat. No. 1,530,288 shows a vending machine for cylinders of
20 compressed gas and fluid. The machine includes an outer cabinet having an opening in the top of the cabinet, an opening at the bottom of the cabinet, and a serpentine passage for horizontally oriented cylinders within the cabinet extending from the top opening to the bottom opening. An empty cylinder is placed in the top opening and a crank arm is rotated which inserts the empty container into the cabinet and moves the container
25 forward into the passage to release a full container out the bottom opening. This machine would require an unreasonable amount of lifting and manipulation of a standard propane cylinder. Accordingly, there is a need in the art for an improved vending machine for valved cylinders of compressed gas.

The U.S. Pat. No. 4,778,042 shows a vending machine for cylinders of
30 compressed gas. The machine includes an outer cabinet having a door opening, a storage chain conveyer for horizontally oriented cylinders within the cabinet, and a rotatable transfer cradle between the door opening and the conveyer which prevents access to the

conveyor. The transfer cradle is provided with sensors so that a data processor can identify an empty cylinder placed in the transfer cradle through the door opening. Thereafter, the transfer cradle and conveyor are operated to load the empty cylinder into the conveyor and to unload a full cylinder from the conveyor into the transfer cradle for
5 extraction through the door opening. This machine is relatively complex and expensive to produce. Additionally, this machine would require an unreasonable amount of lifting and manipulation of a standard propane cylinder.

The U.S. Patent No. 5,829,630 shows a propane cylinder vending machine having a cabinet with first and second openings sized to allow the valved cylinders to pass
10 therethrough in an upright orientation. A conveyor is provided within the cabinet, which extends from the first opening to the second opening to move the cylinders therebetween. The conveyor supports the cylinders in an upright orientation. An empty cylinder verification system and an anti-theft system having mechanically inner and outer doors are provided.

15 It remains desirable to provide an effective and efficient vending machine for vending articles including propane tanks and the like that allows only a single article to be dispensed at the time of vending while also allowing exchange of the articles and preventing theft of the articles.

20 SUMMARY OF THE INVENTION

The present invention concerns a propane tank vending machine that includes a generally rectangular box-shaped frame enclosed except at a front side, the sides defining an interior portion of an enclosure. The vending machine includes a rotator assembly rotatably mounted in the interior of the enclosure, the rotator assembly being operable to
25 receive a plurality of propane tanks. A door member is hingedly attached to the frame at the front side. The door member is connected to an indexing assembly that is operable to rotate the rotator assembly when the door member is moved from a door closed position to a door open position. The rotator assembly is configured to present only one storage location at a time when the door is open.

30 In a preferred embodiment, the rotator assembly has three trays vertically stacked and each tray has eight storage locations defined by dividers. The indexing assembly includes a first arm for enabling the rotator assembly to rotate and a second arm for rotating

the rotator assembly. The rotator assembly has a plurality of apertures formed therein each corresponding to one of the storage locations and the indexing assembly includes a pin for selectively engaging the apertures to prevent rotation of the rotator assembly. The rotator assembly also includes a lever arm mounting the pin, the lever arm being in a normal position with the pin engaging one of the apertures when the door member is in the closed position and the lever arm being moved by engagement with the first arm to a released position disengaging the pin from the one of the apertures. The rotator assembly further includes a plurality of projections, the second arm engaging one of the projections during an opening of the door member to rotate the rotator assembly.

10

DESCRIPTION OF THE DRAWINGS

The above, as well as other advantages of the present invention, will become readily apparent to those skilled in the art from the following detailed description of a preferred embodiment when considered in the light of the accompanying drawings in which:

15

Fig. 1 is a fragmentary perspective view of a vending machine in accordance with the present invention shown in a door closed position;

Fig. 2 is an exploded fragmentary view of the vending machine shown in Fig. 1 in a door open position;

20 Fig. 3 is an enlarged exploded perspective view of the indexing and rotating assembly shown in Fig. 2; and

Fig. 4 is a perspective bottom view of the lower tray of the rotator assembly shown in Fig. 2.

25

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to Fig. 1, a propane tank vending machine or unit in accordance with the present invention is indicated generally at **10**. The propane tank vending machine **10** includes a plurality of vertical support members **12** extending between a generally square or rectangular upper frame **14** and a generally square or rectangular lower frame **16**, forming a generally rectangular box-shaped frame, indicated generally at **17**. The upper frame includes a plurality of bracing members **15** extending across corners of the upper frame **14** to provide stiffness and support thereto. A generally

planar overhead or top member 18 and a generally planar base member 20 extend across the upper frame 14 and the lower frame 16, respectively, to enclose a top and a bottom respectively of the vending machine 10. A wall 22 is representative of walls extending between pairs of the support members 12 and the frames 14 and 16 to enclose a left side 24, a right side 26, and a rear side 28 of the vending machine 10. Preferably, the top member 18, the base member 20, and the walls 22 are constructed of a wire mesh material or the like. The top member 18, the base member 20, and the walls 22 enclose five of the six planar surfaces of the vending machine 10 while advantageously allowing users of the vending machine 10 to view the contents thereof.

10 A door member 30 is hinged along one vertical edge to a one of two spaced vertical door frame members 32 to enclose a door opening 34 between the door frame members 32 on a front side 36 of the vending machine 10. The door frame members 32 extend between the upper frame 14 and the lower frame 16 at the front side 36 of the vending machine 10. The width of the door opening 34 is sized to allow a standard-sized propane tank 38 aligned therewith to pass therethrough. The open space between each of the door frame members 32 and the adjacent support member 12 is such that a standard-sized propane tank 38 will not pass therethrough. The door member 30 includes a handle 40 attached to an exterior surface thereof for moving the door member 30 between closed and open positions as discussed in more detail below. A locking mechanism 42 is attached to a plurality of frame members 44 on the front side 36 of the vending machine 10 adjacent the door member 30. The locking mechanism 42 is preferably a coin or token operated locking device, such as one commercially available from Monarch Coin & Security, Inc., Covington, KY, or similar device, to allow for limited access to the vending machine 10.

25 A plurality of horizontal support members 46 extend between the support members 12 and the door frame members 32 for providing stiffness and support to the vending machine 10. The spaces formed between the support members 12, the door frame members 32, the frame members 44, and the horizontal support members 46 is enclosed by a plurality of walls 48, each of which are preferably constructed of a wire mesh material similar to the top member 18, the base member 20, and the walls 22 to enclose the vending machine 10 while advantageously allowing users of the vending machine 10 to view the contents thereof. A stabilizer foot 49 is attached to a lower end

of each of the support members **12** to provide stability to the vending machine **10**. The stabilizer foot **49** may include a conventional vertical threaded fastener for leveling the vending machine **10**. Alternatively, a conventional caster with a foot-operated lock could be substituted for the ground engaging portion of the foot **49**.

5 Referring now to Figs. 1 and 2, a rotator assembly, indicated generally at **50**, is disposed in an interior of the above-described enclosure of the vending machine **10** and includes a generally disk-shaped first or lower tray **50a**, a generally disk-shaped second or middle tray **50b**, and a generally disk-shaped third or upper tray **50c**. Each of the trays **50a**, **50b** and **50c** is fixedly mounted at a central aperture thereof on a vertical shaft
10 member **52**. The shaft member **52** is rotatably mounted at opposite ends to the upper frame **14** by an upper support assembly **52a**, extending across the upper frame **14** between the sides **24** and **26**, and to a similar lower support assembly **52b** attached to the lower frame **16**. Preferably, each of the support assemblies **52a** and **52b** includes a bearing **52c** disposed therein to allow the shaft member **52** to rotate. Each of the trays
15 **50a**, **50b**, and **50c** is adapted to receive a plurality of propane tanks **38**, best seen in Fig. 1. Each of the tanks **38** rests in an upright position on an upper surface of one of the trays, **50a**, **50b** or **50c**, between an adjacent pair of a plurality of spaced apart retaining members or dividers **53** extending upwardly from the upper surfaces of the trays **50a**, **50b**, or **50c**. Each of the dividers **53** includes a substantially vertical beam **54** mounted
20 adjacent a periphery of the associated one of the trays **50a**, **50b**, or **50c** and a horizontal beam **56** extending between the shaft **52** and an upper portion of the vertical beam **54**. Preferably, the dividers **53** are evenly spaced apart in a circle extending around the shaft **52** to define a plurality of tank storage locations **58** each sized to receive one of the standard-size propane tanks **38**. Each of the trays **50a**, **50b** and **50c** is sized for eight of
25 the storage locations **58** for a total of twenty-four. Each storage location **58** is further defined by a stop **59** extending upwardly from the upper surface of the associated tray **50a**, **50b** and **50c**. The stops **59** are disposed substantially equidistant between the dividers **53** that define each of the storage locations **58** and are attached at the periphery of the associated tray. Alternatively, any suitable number of dividers **53** can be used
30 depending upon the diameter of the trays **50a**, **50b** and **50c** and the size of the objects to be vended. Preferably, when the trays **50a**, **50b**, and **50c** are attached to the shaft member **52**, the mounting locations **58** are vertically staggered or offset such that only

one of the storage locations **58** is accessible through the door opening **34** at a time as discussed in more detail below.

The lower tray **50a** includes a plurality of equally radially spaced apertures **51** extending therethrough. The apertures **51** are equal in number to the total number of tank storage locations **58** on the rotator assembly **50**. An indexing and rotating assembly, indicated generally at **60**, is attached to a lower portion of the door member **30**. The assembly **60** is operable to rotate the rotator assembly **50** from one aperture **51** to the next aperture **51** each time the door member **30** is moved from the closed position, shown in Fig. 1, to the open position, shown in Fig. 2.

10 Referring now to Fig. 3, the indexing and rotating assembly **60** is shown in greater detail. The assembly **60** includes a rotating assembly, indicated generally at **61**, having a generally L-shaped base **62** attached to a lower portion of the door member **30**. When the door member **30** is moved from the closed position to the open position, the base **62** moves with it. An upper swing arm **64** and a lower swing arm **66** are attached to
15 and extend outwardly from a portion of the base **62** adjacent the inner surface of the door member **30**. The upper swing arm **64** preferably includes an offset portion **64a**. The swing arms **64** and **66** are spaced apart vertically on the base **62** by a distance indicated by an arrow **68**. The respective longitudinal axes of the swing arms **64** and **66** are spaced apart horizontally by a distance indicated by an arrow **70**. The assembly **60** also includes
20 a fixed assembly, indicated generally at **71**, having an upper plate **72**, partially cut away, and a lower plate **74** spaced apart as indicated by an arrow **76**. The upper plate **72** and the lower plate **74** are each attached to the lower frame **16** by any suitable means such as by fasteners, a welded connection, or the like.

A guide member **78** includes a ramped portion **80** and a horizontal planar portion
25 **82**. The ramped portion **80** is pivotally attached to the upper plate **72**. The planar portion **82** is fixedly attached to a support member **84** extending upwardly from the upper plate **72** and is disposed above the upper plate **72** by a predetermined distance. An angled surface **80a** of the ramped portion **80** is adapted to rest on an upper surface of the upper plate **72**.

30 A lever arm **86** includes a free first end **88** having a ramped surface **90** and a second end **92** pivotally attached to the lower frame **16** by an attachment bracket **94**. A pin assembly **98** includes a pin support **96** that extends outwardly from the lever arm **86**

intermediate the first end **88** and the second end **92**. The pin assembly **98** also includes a pin guide **99** attached to the lower frame **16** and a pin **100** mounted on the pin support **96** and extending upwardly through an aperture in the pin guide **99**. A spring (not shown) biases the pin **100** in an extended position shown in Fig. 3. In the extended position, the
5 pin **100** engages with a one of the apertures **51** formed in the lower tray **50a**, preventing the rotator assembly **50** from rotating. A bracket **102** is attached to the lower plate **74** adjacent the lever arm **86** and includes a ramp **104** pivotally attached thereto. The ramp **104** includes a forward ramped surface **104a** and a rear ramped surface **104b**. A groove **106** is formed in the lower plate **74** below the lever arm **86** and is sized to permit the
10 lever arm **86** to pass therethrough.

When the door member **30** is moved from moved from the closed position (Fig. 1) to the open position (Fig. 2), the swing arms **64** and **66** of the rotating assembly **61** move in a direction indicated by an arrow **108**, best seen in Fig. 2. As the assembly **61** moves, the lower swing arm **66** first engages with the ramp **104** and begins to travel up
15 the forward ramped surface **104a** and then engages the ramped surface **90** of the lever arm **86**. As the assembly **61** continues to move, the swing arm **66** begins to displace the lever arm **86** downwardly under the influence of gravity and the lever arm **86** pivots about the second end **92** attached to the attachment bracket **94**. The lever arm **86** displaces downwardly into the groove **106** and, as the lever arm **86** moves downwardly,
20 the pin **100** is retracted from the aperture **51** through the aperture in the pin guide **99**. Now the rotator assembly **50** is free to rotate.

After the lower swing arm **66** engages the ramped surface **90** of the lever arm **86**, and as the rotating assembly **61** continues to move, the upper swing arm **64** later engages with and travels up the ramped portion **80** of the guide member **78** and engages the
25 planar portion **82** of the guide member **78**. When the upper arm **64** engages with the planar portion **82**, the upper arm **64** is disposed directly below the lower tray **50a**. At or near the same time as the lower arm **66** moves the pin **100** downwardly, the upper arm **64** engages with a one of a plurality of projections **110**, best seen in Fig. 4, extending downwardly from a lower surface **111** of the lower tray **50a**. The number of the
30 projections **110** corresponds to the number of apertures **51** and to the number of mounting locations **58** on the rotator assembly **50**. As the upper arm **66** engages the projection **110**, the lower arm **64** has moved the lever arm **86** downwardly into the

groove **106** and moved the pin **100** downwardly, which disengages the pin **100** from the aperture **51** and allows the rotator assembly **50** to rotate. The force utilized to move the door member **30**, therefore, is utilized to rotate the rotator assembly **50** when the upper arm **66** engages the projection **110**.

5 Assuming the rotating assembly **61** continues to move in the direction **108**, the upper arm **64** continues to move the rotator assembly **50** until the upper arm **64** reaches a trailing edge **82a** of the planar portion **82** of the guide member **78**. When the upper arm **64** reaches the trailing edge **82a**, the arm **64** drops to an upper surface of the lower plate **72**, disengaging from the projection **110** and ceasing to rotate the rotator assembly **50**. At
10 or about the same time as the upper arm **64** drops, the lower arm **66** reaches a point in its travel in the direction **108** where it disengages from the lever arm **86**. When the lower arm **66** disengages from the lever arm **86**, the spring (not shown) returns the lever arm to its rest position, and the pin **100** returns to the extended position. The predetermined distance traveled by the rotator assembly **50** is such that when the pin **100** returns to the
15 extended position, the pin **100** engages with the next aperture **51** that adjacent to the one of the apertures **51** from which it had previously been disengaged. The pin **100**, when engaged in a one of the apertures **51** prevents the rotator assembly **50** from being rotated and prevents the removal of more than one of the propane tanks **38** while the door member **30** is open.

20 The door member **30** is fully opened at substantially 90° from the closed position. The assembly **60** allows the rotator assembly **50** to rotate only a predetermined angular distance when the door member **30** is moved from the fully closed position to the fully open position. The assembly **60** also prevents movement of the rotator assembly **50** while the door member **30** remains open. With the configuration shown, each time the
25 door **30** is opened, the indexing and rotating assembly **60** will rotate the rotator assembly **50** 15°.

While the present invention has been described wherein the rotator assembly **50** is rotated 15°, those skilled in the art will realize that the configuration may be altered to rotate the assembly **50** for any desired radial angle depending on the size and the number
30 of the articles to be vended.

Preferably, the locking mechanism **42** is coin-operated or token-operated wherein the door member **30** may be opened only when a coin(s) or token(s) is inserted into the

locking mechanism 42 thereby permitting unattended operation. The propane tank vending machine 10 is capable of dispensing filled propane cylinders 38 and is also advantageously capable of exchanging an empty single cylinder 38 for a single full cylinder 38. Preferably, the door member 30 includes a spring-loaded device (not
5 shown) or similar device such that if the door member 30 is left open, it will close on its own.

Furthermore, the propane tank vending machine 10 is designed to permit an authorized person to insert a "hand held" tool when the door member 30 is opened to depress the lever arm 86 thereby disengaging the pin 100 and allowing free rotation of
10 the rotator assembly 50 for loading and unloading the cylinders 38.

In accordance with the provisions of the patent statutes, the present invention has been described in what is considered to represent its preferred embodiment. However, it should be noted that the invention can be practiced otherwise than as specifically illustrated and described without departing from its spirit or scope. While propane tanks
15 or cylinders have been described, the machine according to the present invention can be used to vend any suitable item.